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10/815,896	03/31/2004	Yoram Gat	42P17823	9302

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EXAMINER

HUNG, YUBIN

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2624

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/815,896	Applicant(s) GAT ET AL.	
	Examiner Yubin Hung	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____ |

[Handwritten Signature]
 01/07/08

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:
 - P. 9, paragraph 26, last 3 lines: Since a segmentation is a partition (separation) of an image into segments (paragraph 16), the meaning of the phrase "pixels outside the *segmentation*" is not clear, and therefore neither is the contrast between these pixels and those inside the segmentation. (Note that no matter how an image is segmented, all its pixels are inside that particular segmentation since the image is made up of all segments resulted from that segmentation.) Moreover, a priority is assigned to "a set of segmentations," not to a single segmentation (paragraph 26, lines 2-3); a single segmentation has a "quality" associated it (paragraph 25, lines 3-5). Therefore the meaning of priority as described in these last three lines is not consistent with paragraphs 16, 25 and the rest of paragraph 26.
 - P. 10, paragraph 29: consider replacing " $I: S \rightarrow R$ " with " $I: SS \rightarrow R$ "
 - P. 10, paragraph 30, line 2: replace "segmentation **S**" with "segmentation S"

- P. 10, paragraphs 31, 32 and 36 (and wherever **S** is used to represent the segmentation space): Since 2^S represents the collection of all subsets of **S**, the segmentation space, the "s" in the superscript should have been bold faced; better yet, a different letter should have been used since in superscript it's hard to discern a bold-faced letter from one that is not.
- P. 10, paragraph 32 and P. 11, paragraph 36: the meaning of cell is not clear (is it a segment in the sense of paragraph 16?)
- P. 10, line 2 of paragraph 33: "pixel in a set S of segmentations" should have been "pixel and a set S of segmentations" since the function M is defined for each pixel p and each set S of segmentations; also it's not clear what "a pixel in a set of segmentations" means.

Appropriate correction is required.

Claim Objections

2. Claim 11 is objected to because of the following informalities: "The image" in line 1 should have been "The imager."

Appropriate correction is required.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

In addition, the USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), ANNEX IV, partly reads as follows:

First paragraph

Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structure and computer programs which impart functionality when employed as a computer component. ...

Second paragraph

Both types of "descriptive material" are nonstatutory when claimed as descriptive material per se. ...

Section (a), second paragraph, beginning at line 7

In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See Lowery, 32 F.3d at 1583-84, 32 USPQ2d at 1035. ...

4. Claims 25-30 are rejected under 35 U.S.C. 101 because the claimed inventions are directed to non-statutory subject matter as follows. Claims 25-30 recite *a machine accessible storage medium storing instructions*. Since the

machine is not necessarily a computer and the instructions are not necessarily computer-executable, the inventions of claims 25-30 are not statutory subject matter. [Note: Applicant can overcome this rejection by rewrite lines 2 and 3 of claim 25 to read "a computer readable medium encoded with computer executable instructions that, when executed by a computer, cause the computer to perform operations comprising:." Also substitute all instances of "processing system" in the dependent claims with "computer" as appropriate.]

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-9, 16, 17, 22-30 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7. Claim 1 recites "iteratively repeating the extraction... highest priority" in the last two lines. It is not clear whether the repetition applies to the step of line 5 only or to lines 5-11 as a whole. Therefore the mete and bound of the claim cannot be ascertained. Claims 2-9 are similarly rejected. [Note: for examination purpose repeating lines 5-11 is assumed.]

8. Claim 16, and similarly its dependent claim 17, recites the limitation "the branch and bound technique" in line 1. There is insufficient antecedent basis for this limitation in the claim. [Note: the "bound and branch" analysis recited in line 8 of claim 10 is more commonly known as "branch and bound" analysis; also, claim 1 uses the term "analysis", not "technique."]

9. Claim 22 recites the limitation "wherein the imaging system comprises a focused ion beam tool" in lines 1-2. It is not clear whether the imaging system of claim 22 is that of claim 18 with an additional element of focused ion beam tool (will be clearly so if "further comprises" is used in the claim instead), or is one that comprises a focused ion beam tool (with possible other elements, which may or may not include an imaging device and a processing system). Therefore the metes and bounds of the claim cannot be ascertained. [Note: It appears that the second "imaging system" in line 1 should have been "imaging device," per Fig. 1, ref. 540 and P. 14, lines 2-4.]

10. Claim 23 recites the limitation "the device under test" in line 1. There is insufficient antecedent basis for this limitation in the claim.

11. Claim 24 recites the limitation "the microelectronic device" in line 2. There is insufficient antecedent basis for this limitation in the claim. [Note: it appears that claim 24 should have been dependent from claim 23.]

12. Claim 25, and similarly its dependent claims 26-30, recites the limitation "the extracted set" in line 10 and "the process" in line 19. There is insufficient antecedent basis for these limitations in the claim.

13. Claim 27 recites the limitation "the refined set" in lines 2-3. There is insufficient antecedent basis for this limitation in the claim. [Note: it appears that "the refined set" should have been "the set of segmentations" since the partition of it results in the refinement.]

Claim Rejections - 35 USC § 102

14. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

15. Claims 1-9 are rejected under 35 U.S.C. 102(a) as being anticipated by Gat ("A branch-and-bound technique for nano-structure image segmentation," IEEE Proc. 2003 Conference on CVPR Workshop, June 2003, pp. 1-6. *Note that the authorship is different from the inventive entity of this application; applicant may be able to overcome the 35 USC 102 rejections by providing an affidavit*

showing that all disclosure in the 2003 paper is the work of the inventive entity, i.e., Messrs. Gat and Haussecker).

16. Regarding claim 1, Gat discloses on P. 4, sect. 4 all limitations:

- inserting a state comprising a set of image segmentations into a queue, the queue being ordered by priority, the set of image segmentations having a priority representing a bound for a quality of the segmentations;
- extracting the state in the queue having the highest priority;
- if the extracted state is a terminal state, halting and outputting the extracted state as a solution;
- if the extracted state is not a terminal state:
- refining the extracted state into a plurality of sets of segmentations, each of the plurality of sets having a priority, inserting the plurality of sets of segmentations into the queue, and
- iteratively repeating the extraction of the state in the queue having the highest priority

17. Regarding claim 2, Gat further discloses

- identifying a structure in the image based on the output
[Sects. 4-6]

18. Regarding claims 3 and 4, Gat further discloses

- (claim 3) wherein the image is an image of a portion of a microelectronic device; and
(claim 4) wherein the structure comprises a wire structure in the microelectronic device
[P. 4, Sect. 6; Fig. 1]

19. Regarding claim 5, Gat further discloses

- wherein an extracted state is a terminal state if the set of segmentations for the state meets a precision standard

[P. 1, Sect. 1, 2nd paragraph ("homogeneity"); P. 5, right column, lines 1-2]

20. Regarding claim 6, Gat further discloses

- wherein refining an extracted state comprises producing a set of segmentation sets that form a partition of the extracted state

[P. 3, left column, the refining function R]

21. Regarding claims 7 and 8, Gat further discloses

- (claim 7) wherein the segmentations of the image are based on one or more geometric models; and

(claim 8) wherein the one or more geometric models represent one or more expected structures in the image

[Abstract; P. 4, Sect. 6; Fig. 1]

22. Regarding claim 9, Gat further discloses

- wherein the quality represents relative intensity of light on pixels of the image

[P. 1, sect. 1, 2nd paragraph; P. 5, left column, the objective function]

Claim Rejections - 35 USC § 103

23. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

24. Claim 10-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gat ("A branch-and-bound technique for nano-structure image segmentation," IEEE Proc. 2003 Conference on CVPR Workshop, June 2003, pp. 1-6. Note that the authorship is different from the inventive entity of this application).

25. Regarding claim 10, and similarly claim 18, Gat discloses:

- An imager comprising: an image receptor to receive an image of a device under test, the image to include a structure in the device under test; and the imager to provide data to the processor
[Sect. 6 (FIB includes an imager); Table1 (the processor processes the image)]
- wherein the structure in the device under test is to be identified based on comparison of sets of image segmentations with one or more models of expected structures, the sets of image segmentations to be evaluated using a bound and branch analysis, each of the sets of image segmentations having a priority representing a bound on a quality of the image
[Abstract; Sect. 4; P. 4, Sect. 6 and Fig. 1]

While not expressly disclosed, Official notice is taken that the inclusion of an interface with a processor is well known in the art and the reason would have been to have the acquired image processed by the processor to obtain desired results.

26. Regarding claim 11, Official notice is taken that directing an imager based on identification result is well known in the art and the reason would have been to perform subsequent tasks such as tracking or inspection (e.g., by zooming in to reveal more detail).

27. Regarding claims 12-14, Gat further discloses

- (claim 12) wherein the structure comprises a nano-structure
- (claim 13) wherein the device under test comprises a microelectronic device
- (claim 14) wherein the structure comprises a wiring structure in the microelectronic device

[Abstract; P. 4, Sect. 6; Fig. 1]

28. Regarding claim 15, Gat further discloses

- wherein the one or more models comprise one or more geometric models of expected wiring structures

[Abstract; P. 4, Sect. 6; Fig. 1]

29. Regarding claim 16, Gat further discloses

- wherein the branch and bound technique comprises ordering sets of image segmentations according to priority and analyzing the set of image segmentations with the highest priority
[Sects. 4-6; Fig. 1]

30. Regarding claim 17, Gat further discloses

- wherein the quality comprises light intensity homogeneity for a set of segmentations
[P. 1, sect. 1, 2nd paragraph; P. 5, left column, the objective function]

31. Regarding claim 19, Gat further discloses

- (claim 19) wherein analyzing the sets of segmentations according to priority order comprises determining whether the set of segmentations with the highest priority is a terminal result; and
- (claim 21) wherein analyzing the sets of segmentations further comprises refining the set of segmentations with the highest priority into a plurality of sets of segmentations if the set of segmentations is not a terminal result
[Sect. 4]

32. Regarding claim 20, Gat further discloses

- wherein the set of segmentations is a terminal state if the set meets a precision standard
[P. 1, Sect. 1, 2nd paragraph ("homogeneity"); P. 5, right column, lines 1-2]

33. Regarding claim 22, Gat further discloses

- wherein the imaging system comprises a focused ion beam tool
[P. 4, Sect. 6]

34. Regarding claims 23 and 24, Gat further discloses

- (claim 23) wherein the device under test is a microelectronic device; and
- (claim 24) wherein the imaging system is utilized to analyze the microelectronic device

[Abstract; P. 4, Sect. 6; P. 5, table 1 and Fig. 1]

35. Claims 25-30 are similarly analyzed and rejected as per the analysis of claims 1, 2 and 7-9, respectively, along with the Official notice that it is well known in the art to store computer-executable instructions in a machine-readable storage medium. The reason for doing so would have been, among other things, to provide a facilitate the distribution of the instructions.

Conclusion and Contact Information

36. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- Hansen et al. ("Relaxation Methods for Supervised Image Segmentation," IEEE Trans. PAMI, Vol. 19, No. 9, 09/97, pp. 949-962)
- Tang et al. ("Geometric model-based segmentation of the prostate and surrounding structures for image guided radiotherapy," Visual Communications and Image Processing 2004, SPIE Vol. 5308 (2004), pp. 168-176)
- Park et al. (US 6,535,632)

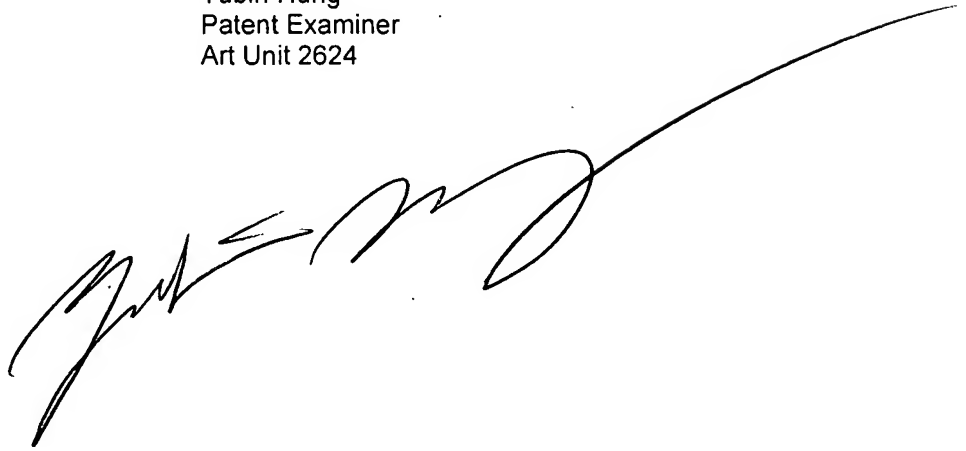
- Donescu et al. (US 7,031,491)
- Aliaga et al. (US 2004/0240707)
- Popovic et al. (US 5,966,140)
- Jodoin et al. (US 6,298,151)
- Yair (US 5,787,194)
- Fan et al. (US 2003/0048936)
- Tyan et al. (US 6,473,517)
- Siu (US 5,302,836)
- Lee et al. (US 7,207,360)
- Tilton (US 2003/0081833)

37. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yubin Hung whose telephone number is (571) 272-7451. The examiner can normally be reached on 7:30 - 4:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew C. Bella can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

38. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Yubin Hung
Patent Examiner
Art Unit 2624

January 7, 2008

A handwritten signature in black ink, appearing to read 'Yubin Hung', is written over the printed name and title. The signature is fluid and cursive, with a long horizontal stroke extending to the right.